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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LAURITZEN, AMANDA L	
ART UNIT	PAPER NUMBER
3737	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/797,377	MA ET AL.	
	Examiner	Art Unit	
	Amanda L. Lauritzen	3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 April 2009 and 02 July 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,9-11,13,14,16 and 17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,9-11,13,14,16 and 17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Arguments

Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

The allowable subject matter indicated in the Office action dated 02 January 2008 is withdrawn. New grounds of rejection are presented in view of Brisken (US 4,530,363) and Robinson et al. (US 6,419,633).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 1, 3-5, 9, 10, 13, 14, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brisken (US 4,530,363) in view of Robinson et al. (US 6,419,633).

Brisken discloses a method and associated transducer array effective for both measuring a volume flow parameter and imaging with ultrasound, including measuring a volume flow

parameter as a function of acoustic energy transmitted from an annular configuration of elements and performing two-dimensional imaging, wherein the transducer array comprises at least three rows of elements, the three rows being straight along an azimuth dimension and having rectangular elements (Figs. 5-8), further comprising using a first group of elements from at least one of the at least three rows of elements as a ring annular element and a second group of elements as a center annular element for measuring a volume flow parameter, and using at least one of the at least three rows of elements for two-dimensional imaging (refer to the abstract, which specifies selective activation of elements as a linear array for sector scanning and selective activation of concentric annular elements for focused Doppler flow measurements; also Fig. 6 in which individual rows of the array are energized for anatomical scanning understood as one of a B-mode and Doppler mode image, described at col. 3, lines 40-61, which leads to positioning the transducer array relative to a vessel of interest based on the localized vessel and switching for near-field Doppler operation of elements with a central annular group designated [1] and a surrounding annular group designated [2] in Fig. 7; further described at col. 3, lines 62 – col. 4, line 8). The uniform sensitivity technique is described at col. 2, line 48 – col. 3, line 4.

Brisken discloses focusing the beam at different depths in the subject by conventional electronic beamforming techniques. Different waveform polarity and apodization are provided to different groups of elements in the measure of a volume flow parameter as described at col. 4, lines 23-29, with groups of elements corresponding to those sharing the same designation from 1-12 in Fig. 8. Anatomical scanning is executed with focus as a function of apodization and delay along at least one row of elements at col. 3, lines 43-50, with a delay between elements 1-9 in Fig. 6. The elements designated [1] and [2] are disclosed to have differing transmit

characteristics, which include apodization, delay and polarity parameters as conventional with electronic beam focusing.

While Brisken discloses varying transmission characteristics to selectively activate designated groups of elements to result in a beam appropriate for one of both measurement of a volume flow parameter and two-dimensional imaging, respectively, it is disclosed that a linear array of elements is activated for performing two-dimensional imaging. However, Robinson teaches a two-dimensional electronic array with concentric elements in azimuth and elevation directions that can be selectively switched to form a 1D array, a 1.5D array, or a 2D array and intermediates therebetween, with the 1.5D array being effective for acquiring two-dimensional images (col. 1, lines 30-59; also col. 2, lines 1-5). It would have been obvious to one of ordinary skill in the art at the time of invention to selectively switch a group of concentric elements to form a 1.5D array in lieu of a 1D array to perform two-dimensional imaging, as taught by Robinson et al., in order to dynamically focus in the elevation direction to enable scanning at various depths within the subject. It is noted that the end result, namely– calculation of a volume flow parameter with two-dimensional imaging using the same array, is accomplished with the system of Brisken and it would be obvious to substitute electrically switched elements to form a 1.5D array in lieu of a linear array to yield comparable resultant two-dimensional images.

Measure of a volume flow parameter and two-dimensional imaging are performed with the transducer array of Figs. 5-8. Concentrating now on Fig. 5 of Brisken, three rows of elements are shown to extend along the azimuth dimension a first length (three rows containing elements [18-26], [27-35] and [36-44]). Kerfs exist between individual elements and the third row (here, designated by elements 18-26) includes at least one kerf extending along the azimuth

dimension less than the first length (this kerf that is less than the first length exists between element rows [18-26] and [11-17]. The elements of Brisken are considered kerf-defined in that insulation surrounds and separates all elements.

Regarding claim 9, the system of Brisken includes a processor to execute calculation(s), a display and a transducer having a plurality of elements in an N x M grid with at least four rows of elements, with a two-dimensional anatomical image responsive to at least one of the rows. Since there is no cited criticality in providing a rectangular arrangement of elements and that this feature solves no stated problem over the configuration(s) taught in the references, it is considered to be an obvious matter of design choice within the skill of the art.

Regarding claim 10, selective activation of elements for annular operation and linear operation requires associated array interconnections.

Regarding claims 14 and 16, the annular configuration of elements is operable to uniformly insonify a vessel with an aperture of similar azimuth and elevation sizes, as per operation according to Fig. 7, which shows a same number of elements extending in both directions and col. 4, lines 1-8 and col. 2, line 48 – col. 3, line 4 for uniform insonification. The elements designated [1] and [2] are disclosed to have differing transmit characteristics, which include apodization, delay and polarity parameters.

Regarding claim 17, turning to Fig. 5, three rows of elements are shown to extend along the azimuth dimension a first length (three rows containing elements [18-26], [27-35] and [36-44]). Kerfs exist between individual elements and the third row (here, designated by elements 18-26) includes at least one kerf extending along the azimuth dimension less than the first length (this kerf that is less than the first length exists between element rows [18-26] and [11-17].

2. Claims 2 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brisken in view of Robinson, as applied to claims 3 and 9, further in view of Nudell (US 5,085,220).

Brisken as appended by the teachings of Robinson et al. include all features of the invention as substantially claimed, including method of flow calculation based upon the power associated with two beams using the ACVF uniform sensitivity technique, but is not particular to the details of a first velocity measure in the calculation of the volume flow parameter; however, in the same field of endeavor, Nudell discloses the method of calculation of a volume flow parameter (cardiac output) that also includes transmission of two Doppler paths to obtain a first velocity and power associated with the first (wide beam) Doppler path and a second power associated with the second (narrow beam) Doppler path (col. 2, lines 37-44). It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the volume flow parameter method of calculation as taught by Nudell with the imaging system and volume flow measure method of Brisken to provide improved accuracy in measure of a volume flow parameter.

3. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brisken and Robinson et al., as applied to claim 9 above, in view of Fu et al. (US 4,431,936).

Brisken discloses all features of the invention as substantially claimed, including providing differing transmission parameters to elements in the annular configuration (col. 4, lines 1-8 as applicable to Fig. 7 in which annular element groups designated [1] and [2] are disclosed to have differing transmit characteristics and apodization), but is not specific to details of providing waveforms of opposite polarity; however, Fu et al disclose providing different transmit waveform polarity in the form of a field direction parameter applied to annular elements (col. 4,

lines 63-64). It would have been obvious to provide means for control of waveform polarity of annular elements as taught by Fu et al, for the purpose of controlling added parameters ultimately for generation of the desired uniform beam pattern (Fu, col. 5, lines 48-66).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda L. Lauritzen whose telephone number is (571)272-4303. The examiner can normally be reached on Monday - Friday, 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian L. Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Amanda L. Lauritzen/
Examiner, Art Unit 3737

/BRIAN CASLER/
Supervisory Patent Examiner, Art Unit 3737